8

Commissioning

8 Commissioning

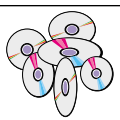
Registration Single Domain

for systems with only one Registration/Housekeeping module.

Registration is the process of setting up the communication between modules. There are three main steps:

- Address allocation
- Submodule Registration and Interconnects
- Registration of Module Interconnects

It is normally best to perform registration in this sequence. Part systems can be registered provided that the module has had an address allocated before registering it to other modules or sub modules.



This is a summary of the System Registration Process. A full, animated version of System Engineering and Registration can be found on the SeaChange CD.

Important: always work from an Interconnect Diagram; this needs to be prepared before Registration occurs.

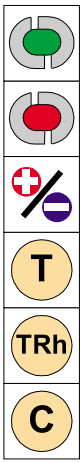
Address Allocation

- check housekeeping module is connected
- press 'reg' button on each module in turn; note that addresses are allocated sequentially in the order in which buttons are pressed. If you have pre-assigned addresses to particular modules on your Interconnect Drawing, make sure you press the buttons in the correct sequence.
- note that there are several different **Address Classes**: addresses will be allocated in sequential order for each class
- it doesn't matter in which order you register the classes, e.g. you could choose to start with all the Zones, and then the AHUs etc. or vice-versa
- don't hold the button down - this performs another function, just press and release
- status light will change colour as you press the button - message send
- status light will flash to show registration successful after a second or so. If no Return Flash then repeat process.
- number of flashes shows module address number - short flash for units, long flash for tens of address number
- make note of module address numbers to update Interconnect Diagram.

Address Classes of Modules

Address class	Doorway Code	Type of Module
Heat Source	H (or B)	Boiler Controller, Secondary Circuit Controller (Heating)
Cool Source	C	Chiller Controller, Secondary Circuit Controller (Cooling)
AHU	A	AHU Controller
Zone	Z	Zone, Slave Zone, DHW Terminal Unit Controllers, Alarm Modules, Pulse Counter
Communications	S	Serial Adaptor
Monitoring	M	Monitoring Module
Router	R	Router Module

Submodule Registration and Interconnects



This includes:

Boiler submodules
AHU submodules
Control demand
Intelligent sensors

- put Parent module into configuration mode
  press ‘Select’ and ‘Override’ together until Status Light flashes slowly - once per second
- on Zone Controllers CNFG and screwdriver will appear on LCD display
- press and release ‘Reg’ button on each Submodule to be registered to this Parent module
- number of flashes shows Submodule Address Number
- If parent module is a Zone Controller, the submodule address will also appear on the Zone display
- make note of Submodule Address Numbers for system documentation
- take Parent Module out of Configuration Mode by pressing ‘Select’ and ‘Override’ together.
- note that the Submodule Interconnect has been made as well; the Submodule needs no further Registration

Note if another module is put into Configuration Mode then all other modules are instructed to automatically exit Configuration Mode, so there is no need to take module out of configuration if further registration is to occur.

Registration of Demand and Supervision Interconnects

There are six different types of module interconnect that can be made between main modules. They are divided into two classes;

Demand interconnects, where a module requests a service from another module, e.g. Fresh Air, Chilled Water, LPHW

Supervision interconnects, where a module is supervising the actions of one or more other modules, e.g.Fan Coil Setpoints.

They are registered as follows:

Settings for Occupancy Demand OCDS Parameter

Target Module	**OCDS Setting in sending module**
Heat Source (Secondary Circuit Controller)	Heat Source Address
Cool Source	Cool Source Address + 25
AHU Controller	AHU Address + 50
DHW Controller	DHW Address + 100

e.g. If sending Occupancy Demand to *H2*, set OCDS to *2*
If sending Occupancy Demand to *C3*, set OCDS to *28*
If sending Occupancy Demand to *A1*, set OCDS to *51*
If sending Occupancy Demand to *Z8*, set OCDS to *108*

Demand Interconnects

Heat/Cool Demand

- put receiver of Energy Demand signal into configuration mode, press and hold 'Select' and Override' buttons until status lamp flashes slowly - once per second
- press 'Register' button on sending modules; this will set HTSC and CLSC on sending modules to point to address of receiver module, e.g. HTSC = 1 will point to H1 which is a boiler module.
- Zone controllers will display the value of HTSC or CLSC

- Modules without displays will flash their Temperature Lamp: count the number of Red Flashes which will indicate the HTSC value that has been set, or count the number of Amber Flashes which will indicate the CLSC value that has been set
- alternatively set HTSC or CLSC Configuration Parameters directly using Zone Controller, InSite or Doorway.

Occupancy Demand

for Zone or Slave Zone Controller sending Occupancy Demand:

- put receiver of Occupancy Demand signal into Configuration Mode, press and hold 'Select' and 'Override' buttons until status lamp flashes slowly - once per second
- press 'Registration' Button on sending modules; this will set the OCDS parameter on sending modules to point to address of receiving module, e.g. OCDS = 101 will point to DHW zone 1, OCDS = 51 will point to AHU1, see table opposite; Zone Controllers will display the value of OCDS
- alternatively set OCDS Configuration Parameter in the sending modules directly using Zone Controller, Insite or Doorway.

for DHW, AHU or Secondary Circuit Controllers sending Occupancy Demand and Secondary Circuit Controller receiving Occupancy Demand:

- the Occupancy Demand signals sent from these controllers must be manually set, to avoid confusion with other types of Interconnect.
- use a Zone Controller, InSite or Doorway to set the OCDS configuration parameter in the sending module as table.
- DHW Controller receiving the OCDS signal must be Registered at an Address below 100

Supervision Interconnects

The registration process for all types of Supervision Interconnects is the same; a Slave link is made between the Supervising Module (the Master) and the Supervised Modules (the Slaves). The type of Supervision Interconnect is defined by the setting of the SPTY parameter in the Slave Modules; this parameter can be set before or after the registration process, and so the type of Interconnect can be changed at any time by changing the SPTY parameter, without re-Registering.

Supervision Interconnects **must** be made by pressing buttons; it is not possible to create these links by adjusting parameters, as you can with Demand Interconnects.

Occupancy Supervision

- Ensure that SPTY (receiver) configurations are set correctly - see module Ikon diagrams
- put sender of Occupancy Supervision signal into configuration mode, press and hold ‘Select’ and ‘Override’ buttons until status lamp flashes slowly, once per second Zone Controller shows CNFG and screwdriver symbol on LCD display
- press ‘Registration’ button on receiving module
- wait 5 seconds between registering each module while the module status light flashes to show the link has been made
- Zone Controllers will show SLVE (slave) and number of receiving module, e.g. when Fan coil Z4 is slaved, “SLVE 4” will be displayed on the master Zone after a few seconds.
- FCU’s will flash their Temperature LED rapidly 5 times after first flashing their own address code as usual This confirms a slave Interconnect has been made without having to go back and check at the Zone Controller

Time Schedule Supervision

- Ensure that SPTY (receiver) configurations are set correctly - see module Ikon diagrams
- put sender of Time Schedule Supervision signal into configuration mode, press and hold ‘Select’ and ‘Override’ buttons until status lamp flashes slowly - once per second, Zone Controller shows CNFG and screwdriver symbol on LCD display
- press ‘Registration’ button on receiving module

- wait 5 seconds between registering each module while the module status light flashes to show the link has been made
- Zone Controllers will show SLVE (slave) and number of receiving module, e.g. when DHW Controller with address Z4 is slaved, “SLVE 4” will be displayed on the master Zone after a few seconds.

Setpoint Supervision

- Ensure that SPTY (receiver) configurations are set correctly - see module Ikon diagrams
- put sender of Setpoint Supervision signal into Configuration Mode, press and hold ‘Select’ and ‘Override’ buttons until status lamp flashes slowly, once per second, and Zone Controller shows CNFG and screwdriver symbol on display
- press ‘registration’ button on receiving module
- wait 5 seconds between registering each module while each module flashes its status light to show that the linking has been made
- Zone controllers will show SLVE (slave) and number of receiving module, e.g. when Fan coil with address Z4 is slaved, “SLVE 4” will be displayed on the Master Zone after a few seconds, if AHU1 is slaved , Zone shows “SAHU1” after a few seconds
- FCU’s will flash their status lamps rapidly 5 times after first flashing their own address code as usual This confirms that the Slave’s Interconnect has been set without having to go back to the Zone Controller

Supply Setpoint Supervision

- Ensure that SPTY (receiver) configurations are set correctly - see module Ikon diagrams
- put sender of Supply Setpoint Supervision signal into configuration mode, press and hold ‘select’ and ‘override’ buttons until status lamp flashes slowly - once per second
- press ‘Registration’ button on receiving module
- wait 5 seconds between registering each module while the module status light flashes to show the link has been made.

Registration
Multi Domain Systems

- each **Domain** will have its own Registration Module, which is a Housekeeping Module with some of its features automatically disabled. This Registration Module will allocate the addresses for the Modules in its Domain.
- addresses will only be allocated by the Registration Module when it is in configuration mode or a special mode called Registration Mode; unlike Single-Domain systems, address allocation does not happen all the time “in background”.
- the Registration Module with the lowest Domain number will automatically assume the System Housekeeping role and will send out Time-of-Day/Day-of-Week information (Real-Time Clock, or RTC) and Outside Temperature to all other Modules. All other Registration Modules will disable these 2 functions to avoid conflicts.

As with Single Domain systems, Registration is the process of setting up the communication between modules.
There are three main steps:

- Address allocation
- Submodule Registration
- Registration of Module Interconnects

It is normally best to perform registration in the above sequence. Part systems can be registered provided that the module has had an address allocated before Registering it to other modules or sub modules.

Important: always work from an Interconnect Diagram; this needs to be prepared before Registration occurs.

Address Allocation

- check Domain Number has been set correctly in each Registration Module - DOMN Parameter. It is best to work with only one Registration Module connected to the network at a time when setting this parameter - temporarily disconnect all of the others.
- Note Domain = 0 forces Housekeeper to Single Domain operation. Do not use this setting on Multi Domain systems but set 1 through' 8
- when all the Domain numbers have been set, you can re-connect all Registration Modules to the network. However to allow more than one Domain to be Registered at the same time it is best to Disconnect the other Domains from the Backbone while Registering. Connect up again when Registration complete.
- now put the Registration Module for the Domain that you wish to start with into Configuration Mode ;press 'Select' and 'Override' together until status light flashes green slowly - once per second.
- now press 'Select' on its own, the status light will now flash red/amber to indicate the Module is in Registration Mode

Address Classes of Modules in Multi-Domain Systems

Address class	Doorway Code	Type of Module
Heat Source	D***n***H (or B)	Boiler Controller, Secondary Circuit Controller (Heating)
Cool Source	D***n***C	Chiller Controller, Secondary Circuit Controller (Cooling)
AHU	D***n***A	AHU Controller
Zone	D***n***Z	Zone, Slave Zone, DHW Terminal Unit Controllers, Alarm Modules, Pulse Counter
Communications	D***n***S	Serial Adaptor
Monitoring	D***n***M	Monitoring Module
Router	D***n***R	Router Module

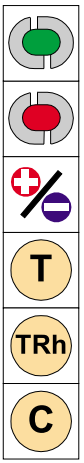
(***n*** = Domain Number)

- press ‘reg’ button on each module in turn; note that addresses are allocated sequentially in the order in which buttons are pressed. If you have pre-assigned addresses to particular modules on your Interconnect Drawing, make sure you press the buttons in the correct sequence.
- note that there are several different **Address Classes**:
- addresses will be allocated in sequential order for each class
- it doesn’t matter in which order you register the classes, e.g. you could choose to start with all the Zones, and then the AHUs etc. or vice-versa
- don’t hold the registration button down - this performs another function, just press and release
- status light will change colour as you press the button - message send
- status light will flash to show registration successful after a second or so. If no return flash then repeat process
- number of flashes shows module address number - short flash for units, long flash for tens of address number
- remember to register the Router in each Domain to its Housekeeper module
- now exit Registration Mode by pressing ‘Select’ and ‘Override’ together until status lamp stops flashing
- make note of module address numbers to update Interconnect Diagram

Now move on to the next Domain:

- now put the Registration Module for the next Domain that you wish to Register into Configuration Mode: press ‘Select’ and ‘Override’ together until status light flashes green slowly once per second
- this will automatically take the previous Domain’s Registration Module out of Registration Mode if it was left in this mode unintentionally.
- now press ‘Select’ on its own, the status light should now flash red/amber to indicate the Module is in Registration Mode.
- now register every Module in this Domain (see above).
- don’t forget to take the Registration Module out of Registration Mode when you’ve finished, or you may accidentally re-register a module from another Domain.

Submodule Registration and Interconnects



This includes

Boiler Submodules
AHU Submodules
Control Demand
Intelligent sensors

- put Parent module into configuration mode
  press ‘Select’ and ‘Override’ together until status light flashes slowly - once per second
- on zone controllers CNFG and screwdriver will appear on LCD display
- press and release ‘reg’ button on each Submodule to be registered to this Parent module
- number of flashes shows Submodule address number
- if Parent module is a Zone Controller, the Submodule address will also appear in the Zone display
- make note of Submodule address numbers for system documentation
- take Parent module out of configuration mode by pressing ‘Select’ and ‘Override’ together.
- note that the Submodule Interconnect has been made as well; the Submodule needs no further Registration

Note if another module is put into Configuration Mode then all other modules are instructed to automatically exit Configuration Mode, so there is no need to take module out of configuration if further registration is to occur.

Registration of Demand & Supervision Interconnects

There are six different types of module interconnect that can be made between main modules. They are divided into two classes; **Demand** interconnects, where a module requests a service from another module, e.g. fresh air, chilled water, LTHW. In Multi-Domain systems, Demand Interconnects can be **Local,** i.e. connected to another Module in the same Domain, or **Global** connected to another Module in a different Domain. Global Interconnects will pass through Routers; Local Interconnects will not.

Supervision interconnects, where a module is supervising the actions of one or more other modules, e.g. fan coil setpoints. Supervision Interconnects can only be Local, i.e. connected from one Module to many others all within the same Domain. Supervision Interconnects will not pass through Routers.

They are registered as follows:

Demand Interconnects

Heat/Cool Demand

These Interconnects can be made by pushing buttons - see Single Domain systems but can also be set using a PC running Doorway or SeaChange InSite

- set the HTSC for heating demand signal or CLSC for cooling demand signal, parameter in the sending Module to "point" at the source of heating or cooling energy.
- the signals can be Local, i.e within the same Domain, or Global - sent from one Domain to another.
- If you set HTSC/CLSC to 1,2, 3 etc, i.e a value less than 1000, then the signal will be sent in the local Domain, and will not pass through a Router.
- If you set HTSC/CLSC to 1001,1002, 1003 etc, i.e a value greater than 1000, then the signal will be sent in the global Domain, and will pass through Routers. The 1000, 2000 prefix is used to set the target Domain number
- don't set HTSC or CLSC to unnecessarily send signals in the Global Domain if the target module is in the same Domain as the sending module, because although this will work, it will load all Domains with unnecessary traffic. The only exception to this would be if the sending and receiving devices were in the same Domain, but separated by Routers.
- It is best to collate demand signals on the local domain using Secondary Circuit Controllers or Floor Controllers and so send single resultant demand signals to the main plant. This reduces backbone traffic and shares the demand collation task across the system.
- SeaChange Insite allows Graphical Drag and Drop Engineering to simplify the setting of these parameters

Target Module	**HTSC/CLSC Setting in sending module**
Target in same Domain	Heat/Cool Source Address
Target in another Domain	Heat/Cool Source Address + (***n*** x 1000) where ***n*** = Domain number

e.g.
If sending Heat Demand from **Domain 1** to **Domain 1, H2**, set HTSC to **2**
If sending Heat Demand from **Domain 1** to **Domain 2, H2**, set HTSC to **2002**
If sending Cool Demand from **Domain 3** to **Domain 4, C4**, set CLSC to **4004**
If sending Cool Demand from **Domain 3** to **Domain 3, C10**, set CLSC to **10**

Occupancy Demand

These Interconnects can be made by pushing buttons see Single Domain systems but are best set using a PC running InSite or Doorway:

- set the OCDS parameter in the sending Module to "point" at the Module controlling the service that you wish to run during the Occupancy period of the sender.
- the signals can be Local, i.e within the same Domain, or Global - sent from one Domain to another.
- If you set OCDS to 51,52, 53 etc, i.e a value less than 1000, then the signal will be sent in the local Domain, and will not pass through a Router.
- If you set OCDS to 1051,1052 1053 etc, i.e. a value greater than 1000, then the signal will be sent in the global Domain, and will pass through Routers. The 1000, 2000 prefix is used to set the target Domain number.
- don't set OCDS to unnecessarily send signals in the Global Domain - if the target module is in the same Domain as the sending module, because although this will work, it will load all Domains with unnecessary traffic. The only exception to this would be if the sending and receiving devices were in the same Domain, but separated by Routers.

Target Module	**OCDS Setting in sending module where sending module is in:**		
	In Target's Domain:	**In D1:**	**In D2: etc.**
Heat Source (Secondary Circuit Controller)	Heat Source Address, H	(H+1000)	(H+2000)
Cool Source	(Cool Source Address, C + 25)	(C+25+1000)	(C+25+2000)
AHU Controller	(AHU Address, A + 50)	(A+50+1000)	(A+50+2000)
DHW Controller	(DHW Address, Z + 100)	(Z+100+1000)	(Z+100+2000)

e.g. if sending Occupancy Demand:
from **Domain 1** to **Domain 1, H2**, set OCDS to **2**
from **Domain 1** to **Domain 2, C2**, set OCDS to **2027**
from **Domain 3** to **Domain 4, A4**, set OCDS to **4054**
from **Domain 3** to **Domain 4, Z11**, set OCDS to **4111**
from **Domain 3** to **Domain 3, C10**, set OCDS to **35**

Supervision Interconnects

The registration process for all types of Supervision Interconnects is the same, and is identical to Single Domain systems; see other section for a full description.

Remember that Supervision interconnects can only function in the local domain and cannot pass through the routers of Multi-domain systems.

A Slave link is made between the Supervising Module (the Master) and the Supervised Modules (the Slaves). The type of Supervision Interconnect is defined by the setting of the SPTY parameter in the Slave Modules; this parameter can be set before or after the registration process, and so the type of Interconnect can be changed at any time by changing the SPTY parameter, without re-Registering.

Supervision Interconnects **must** be made by pressing buttons; it is not possible to create these links by adjusting parameters as you can with Demand Interconnects.

Supervision Interconnects:

- Ensure that SPTY (receiver) configurations are set correctly - see module Ikon diagrams

- put sender of Supervision signal into configuration mode, press and hold ‘select’ and ‘override’ buttons until status lamp flashes slowly - once per second. Zone Controller modules show “CNFG” and screwdriver symbol on LCD

- press ‘registration’ button on receiving module
- wait 5 seconds between registering each module while the module flashes its status light to show the link has been made

- Zone controllers will show SLVE (slave) and number of receiving module, e.g. when Fan coil with address Z4 is slaved, “SLVE 4” will be displayed on the master Zone after a few seconds.
- FCU’s will flash their Temperature LED rapidly 5 times after first flashing their own address code as usual This confirms a slave Interconnect has been made without having to go back and check at the Zone Controller

Tips for Registering Large Systems

If you are commissioning a large system with Terminal Units, these are often mounted in the ceiling void, and it is inconvenient to visit each unit several times in order to press its register button to allocate addresses and set up Interconnects.

It is possible to register a system by visiting each Module once only; this is because the system allows Address Allocation and Interconnects to be created simultaneously.

Typically, a Fan Coil installation will consist of a Zone Controller supervising the Occupancy or Setpoint + Occupancy of a number of Fan Coils; these Fan Coils may need to send their Heating and Cooling Demands to other Modules. Using the conventional Registration technique, this would require 4 visits to each Fan Coil. However, using the advanced technique detailed below, you can register the system with a single visit:

- register your Zone Controller first, so that it obtains an address - if a Multi-Domain system, you will need to put the Registration Module for this Domain into Registration Mode - see " Address Allocation" for Multi-Domain systems
- now put the Zone Controller into Configuration Mode - if a Multi-Domain system, the Registration Device will stay in Registration Mode
- register each Fan Coil; an address will be allocated, and the Slave Interconnect between the Zone Controller and the Fan Coil will be made simultaneously.
- now take the Zone Controller out of Configuration Mode
- the SPTY parameters in all of the Fan Coils can now be adjusted using InSite or Doorway to create the right type of Interconnect - i.e Setpoint or Occupancy Supervision
- the HTSC and CLSC parameters in each Fan Coil can be adjusted using InSite's Drag and Drop Engineering Technique or Doorway to send the Heating and Cooling Demand signals to the Module controlling the Fan Coil's source of energy, thus creating Energy Demand Interconnects

Incorrect Re-Allocation of Addresses

The System Housekeeping Module and Registration Modules contain an **Address Table**; this is where the addresses of all of the Modules that have been registered are recorded. These Modules have a useful automatic self-repairing feature which re-allocates addresses to replacement Modules after a Module failure (see Repairing a System - Failed Module). This feature can be problematic when commissioning a large site; if a part of the system is powered down or disconnected from the network, and then a new part of the system is registered, the addresses from the existing part will be re-allocated to the new part. This is because the Housekeeping or Registration Module thinks that the powered-down Modules have failed, and that the new Modules are their replacements.

To stop this happening during commissioning, set **RPLN** parameter in the Housekeeping and Registration Modules to zero; this stops the Module re-allocating addresses which have already been assigned. When Commissioning is complete, set **RPLN** back to **1**; this will enable the self-repairing mechanism again.

Re-Registration of Modules

Changes to Registration Module Addresses

Clearing the Housekeeping Modules Address Table

The System Housekeeping Module contains an **Address Table** where the Addresses of all of the Main Modules that have been Registered are recorded. If it is necessary to re-register the modules so they have different addresses, then this Address Table may be cleared and the Modules re-Registered.

- Clearing the Address table does not reset the Interconnects. If HTSC, CLSC etc addresses are changed then the Interconnects will have to be reassigned by Registration or via InSite or Doorweay
- The Address Table is held in Non Volatile Memory and cannot be cleared by removing the power from the module - the table must be deliberately cleared
- to clear the Address Table hold down the **Register Button** on the Housekeeping Module until the Status Light starts to flash repidly, then release the button **immediately**.
- the table is now **cleared** ready to be overwritten but it is not deleted.
- now Register **all** of the Modules in the system again in the correct order to give the addresses required. The cleared Address Table is over written with the new Addresses.
- it is vital that **all** the modules are re-Registered otherwise the system may have Modules with Duplicate Addresses, which would lead to malfunctions
- **Submodules** must be re-Registered if their main module's Address has changed otherwise they will be Interconnected to the wrong Module
- for **Multi-Domain** system, each Domain's addresses are held in the Domain's Registration Module - often a Floor Controller. Each Domain can be independently re-Registered as described above; there is no need to re-Register the entire system if only one Domain is affected.

Changes to Registration - SubModules

Moving a SubModule from one Main Module to another

- if you wish to ReRegister a SubModule to another main Module, then simply Register the Submodule to its new Main Module. The SubModule will sever its link to the original main module, and form an Interconnect with the new main module
- however, the original main Module will retain the details of its lost submodule, and if you subsequently document the system using SeaChange InSite, the original parent will report a 'missing' SubModule. Although this will not affect the function of the system, it can be misleading, so to correct the documentation, Clear the Main Modules' Address Table

Clearing a Main Module Address Table

Each Main Module in the system contains a small **Address Table** where the addresses of its Sub Modules are recorded. To Register the modules again, so that they have different addresses, clear this address table, and re-registered the submodules.

- to clear the Address Table, hold down the Register button on the Module until the status lamp starts to flash, then release the button **Immediately**
- the table is now **cleared,** ready to be overwritten, but it is not **deleted**
- now Register **all** of the Sub Modules belonging to this Module again in the correct order to give the Addresses that you require. The cleared Address Table will be over-written with the new Addresses.
- it is vital that you **re-register all SubModules**; if you don't do this, the system may have Modules with duplicate addresses, which will lead to system malfunction.

Repairing a System
Failed Housekeeping Module

Replacing a Housekeeping Module
Rebuilding the Address Table

The System Housekeeping Module contains an **Address Table** where the addresses of all of the main Modules that have been registered are recorded. If the Housekeeping Module fails, or needs to be replaced for another reason, the new Housekeeping Module can be made to 'learn' the contents of the table in the old Housekeeper; it does this by polling all of the Main Modules in the system, and recording their address and Neuron I/D serial number.

- to rebuild the Address Table, hold down the Register button on the Housekeeping Module until the status lamp starts to flash rapidly, then watch the flashing rate of the lamp
- after 5 or so rapid flashes, the flashing rate slows down; now you can release the Register button
- the status lamp should continue to flash for several minutes; the Housekeeping Module is now polling all of the Modules in the system, and writing their address and serial number into its Address Table
- when the status lamp stops flashing, the process is complete
- note, if any of the Modules are off-line, disconnected from the network or a segment of network is unpowered, those Modules will not be recorded by the Housekeeper
- you can use the SeaChange InSite tool to check that the system has rebuilt correctly if desired
- finally, make any changes to the default Configuration Parameters that are necessary - this should have been recorded on the Interconnect Diagram and/or in the SeaChange InSite as installeddata base.

Repairing a System - Failed Main Module

Replacing a Main Module - Obtaining an address

If a Main Module fails, or needs to be replaced for another reason, the replacement Module needs to have an address allocated to it. Normally, unless the **RPLN** parameter has been set to a zero (default is 1), the replacement controller will receive the same address as the old Module.

- remove the old Module from the system
- Wait for 5 minutes before installing the new Module this gives sufficient time for the Housekeeper to have noticed the loss of the original Module
- now press the register button on the Module; the Housekeeper will notice the replacement Module is of the same address class as the 'lost' module, and will allocate the old Module's address to it.
- note that if the RPLN parameter in the Housekeeping Module is set to zero, as may happen during commissioning of larger systems, the Housekeeper will not re-allocate an existing address, but will allocate the next spare number
- if 2 or more Modules fail simultaneously, the lowest address will be re-allocated first

Replacing a Main Module
Rebuilding a Main Module's Address Table

Each Main Module in the system contains a small *Address Table* where the addresses of all of the Sub Modules that have been registered to it are recorded. If you need to replace a Main Module, its SubModules must be registered to the replacement. It is probably simpler to re-register the SubModules in the usual way - see Registering SubModules, but the new Module can be made to 'learn' the contents of the table in the old Module; it does this by polling all of the SubModules in turn, and recording their address and Neuron I/D serial number. This may be useful if the SubModules are located in inaccessible positions.

- to rebuild the Address Table, hold down the Register button on the new Main Module until the status lamp starts to flash, then watch the flashing rate of the lamp
- after 5 or so rapid flashes, the flashing rate slows down; now you can release the Register button

- the status lamp should continue to flash for a few seconds; the Main Module is now polling all of the SubModules that may belong to it, and writing their address and serial number into its Address Table
- when the status lamp stops flashing, the process is complete
- note, if any of the SubModules are off-line, disconnected from the network or a segment of network is unpowered, those Modules will not be recorded by theMain Module
- you can use SeaChange InSite tool to check that the system has rebuilt correctly if desired
- now you must adjust any Configuration Parameters and re-make Interconnects with other Modules - refer to your Interconnect Diagram

Replacing a SubModule

If a SubModule fails, or needs to be replaced for another reason, the replacement SubModule needs to be re-registered to its Main Module.

- remove the old SubModule from the system
- Wait for 5 minutes before installing the new Module this gives sufficient time for the Housekeeper to have noticed the loss of the original Module
- now put the Main Module into Configuration Mode, and press the register button on the SubModule; the Main Module will notice the replacement SubModule is of the same address class as the ‘lost’ SubModule, and will allocate the old Submodule’s address to it.
- now you must adjust any Configuration Parameters that were set in the original SubModule - refer to your Interconnect Diagram.

Replacing a Slave Module

- Allocate Address to Module as above
- Master - Slave link must be remade. This cannot be automatically rebuilt

Engineering Parameters

Setting Configuration Parameters using Zone Controller

- Put Zone Controller into Configuration Mode. Press ‘Select’ and ‘Override’ together and hold until LCD shows CNFG and screwdriver symbol
- press and release ‘Select’ on target module to change its parameters. If the Zone Controllers own parameters are to be changed then ignore this step.
- press and hold ‘Select’ on Zone Controller
- rotate knob - clockwise for monitoring parameters
  - anticlockwise for configuration parameters

  until relevant parameter is displayed
- release ‘Select’ on zone controller
- press and hold ‘Override’ and rotate Knob to adjust parameter
- release ‘Override’ to set parameter. Parameter value flashes once to show that it has been set in the target module
- repeat for other parameters
- exit from Configuration Mode by pressing ‘Select’ and ‘Override’ together.

Manual Override

All control modules have Manual Override that allows their outputs to be forced ON and OFF to help commissioning, plant diagnosis and maintenance.

- to put module into Override press and hold ‘Override’ button until status lamp flashes rapidly - 5 times per second
- successive pushes of the ‘Override’ button will index the module through various override modes - their exact function depends on the module type, see below.
- at the end of the override sequence the module returns to automatic mode and the Status Lamp stops flashing
- On Boilers Chillers and Air Handlers, all interlocks, timers and maximum and minimum temperature controls continue to function normally in Override Mode
- Override Mode does not automatically time out but modules can be forced in and out of Override Mode over the communications network from InSite or Doorway the PC based Supervisor program

Override Mode

With module in Override Mode, pressing Override will sequence the module through the steps below.

Generic Override Functions

AHU Controller, AHU submodules, Heat Recovery, Preheater, Humidity, Secondary Circuit, DHW, Fan Coil/VAV, Actuator Controller, Pool, Door Heater

1. puts module into Occupancy so fans/pumps will run

Note: AHU will run to normal temperature setpoint

2. drives Heat Output to 100% (Cool output 0%) temperature indicator RED

3. drives Cool output to 100% (Heat output 0%) temperature indicator AMBER

4. return to Auto mode

Special Override Functions

Boiler Controller

1. creates a Flow Temperature demand MXVT Parameter that will bring on pumps and boilers on Boiler Module and Cascade and Pump Changeover submodules
2. return to Auto Mode

AHU submodules, Mixing Dampers

1. forces Dampers to Minimum Fresh Air position
2. return to Auto Mode

Pump Changeover, Fan Changeover

- short press of 'Override' button forces changeover of Duty Pump or Fan. Longer (5 sec.) press of 'Override' initiates Manual Override. Short press will also reset unit after failure of both pumps/fans.

1. puts unit into Occupancy so Pumps Fans will run
2. return to Auto Mode

Diagnostics - what the indicators mean

Every control module is fitted with two indicators in the top left of the unit that show the State and Status of the module

Temperature Indicator

Status Indicator

legend

 static

 flashing

Temperature Indicator

Normal Control	control variable at setpoint
Normal Control	control variable below setpoint (Heating mode)
Normal Control	control variable above setpoint (Cooling mode)
not functioning	module not functioning or not powered up - check network connections
Pump Changeover fan changeover	Duty pump/fan fail - running on standby
Pump Changeover fan changeover	both Duty or standby pumps/fans failed
AHU Fan Coil/VAV	primary sensor fail - unit shut down
Boiler Pump Changeover Secondary Circuit Zone	STOP alarm active - unit shut down

Note: in Manual Override, Setup Mode, Registration of Heat and Cool Demands, Temperature Indicator has special functions - see appropriate section of this guide

Status Indicator

module in operation

Occupation mode for Zone, AHU, Fan coil, DHW

Demand mode for Boiler, Secondary Circuit to show receiving active Heat/Cool Demand signals

slow flash (1 per second)	module in Configuration Mode
medium flash (3 per second)	module rebuilding Registration Table
fast flash (5 per second)	module in Manual Override mode

Note: status lamp also flashes during Registration to show module address - short flash for units long flash for tens.

or module fail — self diagnostic routine has detected fault and shut down module

floor controller multi domain system, registration mode

Stroke Time Set-up

Modules with Raise/Lower valve outputs or Time Proportional outputs can have their valve stroke time or minimum run time set by PERD HPRD or CPRD parameters

- AHU controllers have two outputs - heating and cooling. Each output is set up as described below. The set up routine will toggle between either output each time it is selected
- Intelligent Valve Actuators have period set to match actuator and it is not changeable

Stroke Time Setup

- press and hold 'Select' button until Temperature Indicator flashes red, valve will close
- when valve fully closed, press and release 'Select' button
- valve will open, Temperature Indicator flashes green, module is timing stroke period
- when valve fully open, press and release 'Select' button again
- unit returns to automatic mode, Temperature Indicator stops flashing Stroke Time period is automatically set.

Note: if a Stroke Time of less than 30 seconds is set then setup process is aborted, Temperature Indicator flashes amber rapidly for 5 flashes. This allows checking of wiring without Stroke Time setup.
For stroke times less than 30 secs period must be set manually

Time Proportional Outputs

- press and hold 'Select' button until temperature indicator flashes red, output will switch off
- press and release 'Select' button - output will switch on, temperature indicator flashes green
- module is timing Minimum Run Time
- press and release 'Select' button to signify end of Minimum Run Period
- unit returns to Automatic Mode - Minimum Run Period is automatically set.
- This method is not suitable for setting Fast Time Proportional Driveres. These do not normally need setting but can be set manually

Zone Controller - User Settings

The Zone Controller is used to set Time Schedules, Temperature and to provide Override. The Slave Zone can only adjust Temperature and Override, its Time Schedule being set from its Master Zone, InSite or Doorway.

Zone and Slave Zone Features

Display normally shows room temperature

Occupation Status

 in occupation period

 out of occupation period

 flashing, preheat period - optimum start

 flashing, cool down period - optimum stop

Override

- press 'Override' button to change Occupation Mode
- turn occupancy off, zone stays off until next scheduled start.
- turn occupancy on, if before last stop time, zone comes on until next scheduled off. If after last stop time, zone comes on for extension period, which is configurable, preset 1 hour.

Note: Override only works on the local Zone, it does not transfer from Master to Slave Zones unless Master Override function is set.

Required Temperature

- rotate adjustment Knob one click, display shows REQD - Required Temperature (occupied setpoint) and will revert to room temperature display after a few seconds
- to change Required Temperature, continue to rotate knob
- to help prevent excessive changes to required temperature, changes are normally limited to 2ºC at a time. They can be altered further after a few minutes.
  To alter the 2 deg Adjustment range, use SPAJ Parameter
- Maximum system temperature preset to 25ºC .
  Use SPMD and SPRG parameters to adjust
- Required Temperature normally reverts to default - preset 20ºC heating, at the end of each day. This is to help energy efficiency.
  To disable this feature set Parameter SPDF = 1

Fabric Protection Mode

Outside the Occupation Period the unit will control to ensure that the space temperature does not fall below the Fabric Protection temperature - preset 10ºC - to guard against condensation and hence fabric damage.

If the Zone turns the heating on in this mode then a snowflake will appear.

Additional Features on Zone Only

The Zone is used to set the Time Schedule for its own area and for any Slave Zones for which it is set up to be the Master Zone. All the adjustments to the time schedule settings are made in a consistent fashion:

- press and hold 'feature' button to show current setting
- rotate adjustment Knob to show desired value
- release button to set new value

Set Clock/Day

- press 'Clock' button to show current time and adjust using knob
- press 'Clock' and 'Day' button together to show current day and adjust

Note: Day and Clock have to be set on only one Zone, others will automatically update, as this process updates the System Clock which resides in the Housekeeping Module
The Time is sent globally by the Housekeeper Module

Set Start/Stop Times for Zone

Each zone has two occupation periods for each of the 7 days of the week which may be individually set.

- select day of the week to view using 'Day' button and knob
- use 'Start 1' button to view first start period and adjust
- use 'Stop 1' button to view first stop period and adjust
- use 'Start 2' and 'Stop 2' buttons to set second period
- to omit any Occupation Period set start and stop times to be same
- repeat for other days or use Copy if time settings are the same

Copy

- select day to copy from using ‘Day’ button
- press and hold ‘Copy’ button. Rotate Knob through days to be copied
- if original day is Monday and copy is through to Friday then all weekdays are copied in one action

Today and Tomorrow

Special times can be set that override the time schedules for today or tomorrow but are volatile and after one use revert to the preset weekly time schedule.

- use ‘Day’ button to select Today (TDAY before MON) or Tomorrow (TMRW after SUN)
- use ‘Start’ and ‘Stop’ buttons to set special time schedule

Holiday

A Time Schedule can be set to work during Holidays

- use ‘Day’ button to select Holiday (HDAY after SUN and TMRW)
- use ‘Start’ and ‘Stop’ buttons to set special Time Schedule

Holiday Period

- use ‘Holiday’ button to set number of days Holiday Period
- Holiday Mode will activate next day
- display will flash ‘Suitcase’ symbol to show Holiday Period set but not yet active
- next day, ‘Suitcase’ symbol will be static and ‘Seagull’ will flash to show Holiday Mode is active.

User Displays

The Zone Controller can be used to display certain other parameters in the system which can be particularly useful to installers and maintenance staff.

User Displays and Remote PV can be shown on the Ikon Interconnect diagram

To view user display parameters

- press and hold Select button
- rotate Knob clockwise to show parameters.

Preset (factory default) parameters are:

1	Room Temperature	ROOM
2	Required Temperature	REQD
3	Zone Control Demand	DMND
4	Outside Temperature	OUTS
5	Boiler flow temperature	FLOW
6	Time & Day	MON-SUN

- release button: display will show parameter selected

To return the display to Room Temperature

- press & hold Select button
- rotate Knob anti-clockwise to beginning of list to show ROOM
- release button

Changing User Displays

It is possible to reconfigure two of the user display parameters No's 4 & 5 - to read other system parameters than those preset. This can be used to display temperatures from other modules e.g. POOL temperature or DHW temperature.

- put Zone into Configuration Mode by pressing & holding Select + Override buttons until Status Indicator flashes
- press Select on target module
- press & hold Select on Zone Controller
- rotate Knob clockwise until target parameter value shown
- release Select button
- press Start 1 & Stop 1 buttons together changes user display 4
- a tick symbol will appear in the display.
- use Select + Knob to find a second target parameter value
- press Start 2 & Stop 2 buttons together changes user display 5
- a tick symbol will appear in the display.
- return Zone to normal Mode - press Select and Override together.

Remote PV (Process Variable)

The Zone Controller normally uses the Room Temperature either measured by its internal temperature sensor or a remote sensor wired into its terminals as the Process Variable that the Zone will control.

It is possible to use a temperature measurement being made by another module in the system as a Remote Process Variable in place of the Room Temperature. The Zone Controller accesses this information from the other module over the communications network.

The Zone Controller will then display the new value and 4-character label, e.g. POOL from a Pool Controller or HW T from a DHW Controller, in place of the ROOM temperature.

To set Remote Process Variable

- press and hold 'Select' and 'Override' buttons on Zone until Status Lamp flashes and CNFG appears on Display - Zone in Configuration Mode
- press 'Select' on target module
- press and hold 'Select' on Zone Controller
- rotate Knob clockwise until target temperature value shown
- release 'Select' button
- press 'Copy' and 'Holiday' buttons together.
- a tick symbol will appear in the display
- unit will now display and work to new process variable.

Note: variable must be a measured temperature parameter. Do not try to use a remote setpoint as a Process Variable by this process.

To Reset User Displays and Remote PV to Factory Defaults

- put Zone into Configuration Mode
- push pair of buttons used to set particular variable i.e.
  'Start 1' and 'Stop 1' for user display 4
  'Start 2' and 'Stop 2' for user display 5
  'Copy' and 'Holiday' for Remote Process Variable
- display will briefly show RSET to show variable has been reset
- exit from Configuration Mode.

Output Driver Types

SeaChange Modules often have several variants available with different Output Driver Options. These outputs are used to drive different sorts of loads; valves, pumps, fans etc. The operation of each type is described here:

Raise/Lower Drivers

what are they?

- Raise/Lower Drivers are for driving Raise/Lower type actuators - often called **Floating** or **3-Point** actuators. These are actuators whose motors have 2 windings which can drive the actuator in one direction or the other. If the “Raise” winding is energised, the motor will drive in one direction to open the damper or valve, if the “Lower” winding is energised, the motor will drive in the other direction to close the damper or valve. If neither winding is energised, the motor will stay idle, and the valve or damper will stay stationary.
- Raise/Lower Drivers use 2 relays or triacs, one for Raise, one for Lower, or a single Analogue output driving an external relay module.

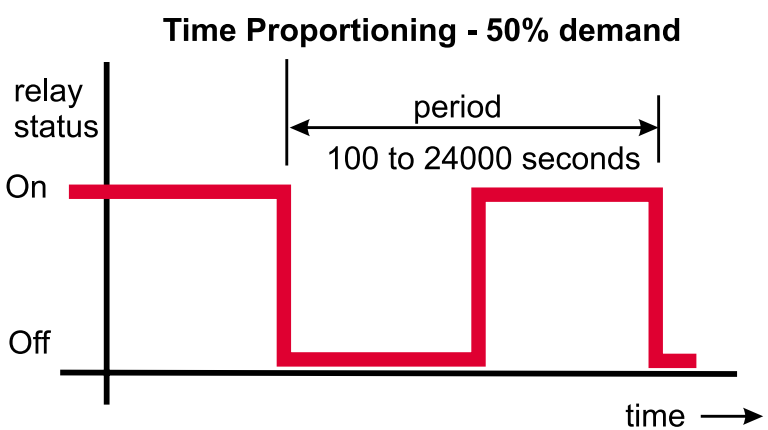
Stroke Time

- it is important that the Module is aware of the correct **stroke time** - the time taken for the actuator to move from fully closed to fully open. The Module determines the current position of the actuator by “dead reckoning” i.e. by knowing how long it has driven the actuator from a known position. Use Set-up Mode on the Module to automatically set the stroke time - see section **8** 32 or set via Configuration Parameter.
- the **SeaChange Raise/Lower Driver** has some unique features for ensuring that it does not lose track of the current actuator position. Every time the actuator drives to 0 (closed) or 100% (fully open), the Module will overdrive the output for an extra 20% of the stroke time to ensure that the actuator has reached the end of its travel.
- If the actuator does not reach 0 or 100% during a 12 hour period, the Module will drive it to one end either fully open or fully closed - with the 20% overdrive and then resume automatic control.
- After a peroid of time at fully open or closed the overdrive is repeated to ensure that the device remains at its full travel

Time Proportioning Drivers

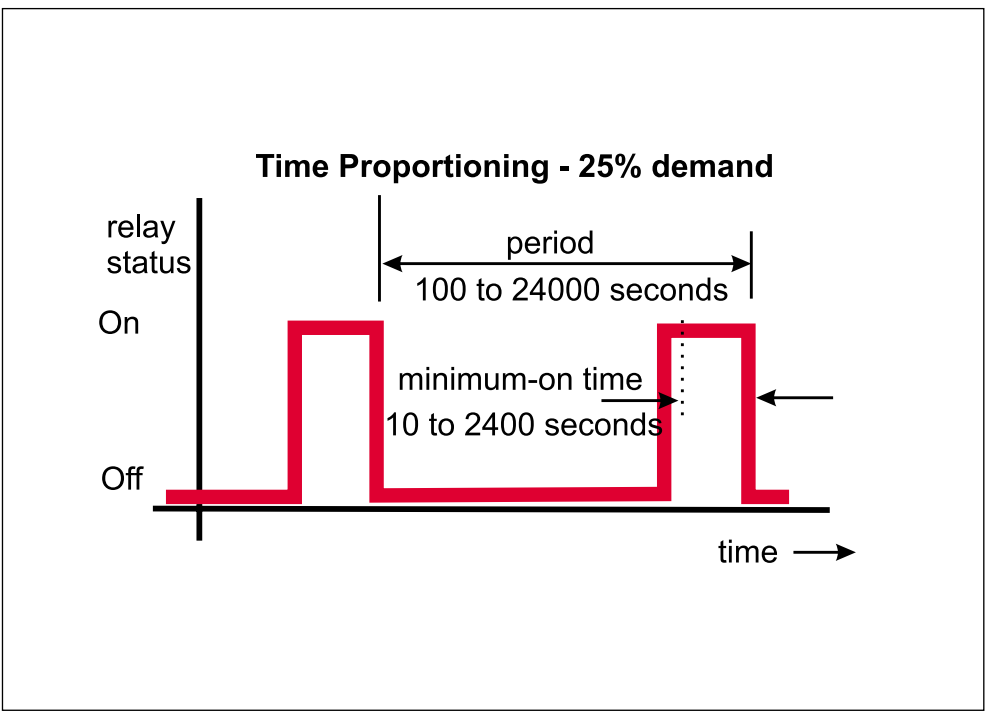
what are they ?

- Time Proportioning Drivers are for driving On/Off devices in a manner which will give a form of proportional control over the load that they are feeding
- examples of typical switching devices are On/Off Valves - motor open, spring return, or Thermally-actuated valves - essentially On/Off devices, Pumps or Fans,or Direct Heating devices - electric heating elements, direct gas fired burners.
- Time Proportioning Drivers use a single Relay or Triac output, or a single Analogue output driving an external relay module.
- when the device is on, it is supplying 100% energy to the load. When it is off, it is supplying 0% energy. If we can turn the device On and Off repeatedly, and control the ratio of “On” time to “Off” time, we can control the energy input to the load between 0 and 100%.



Minimum-On Time

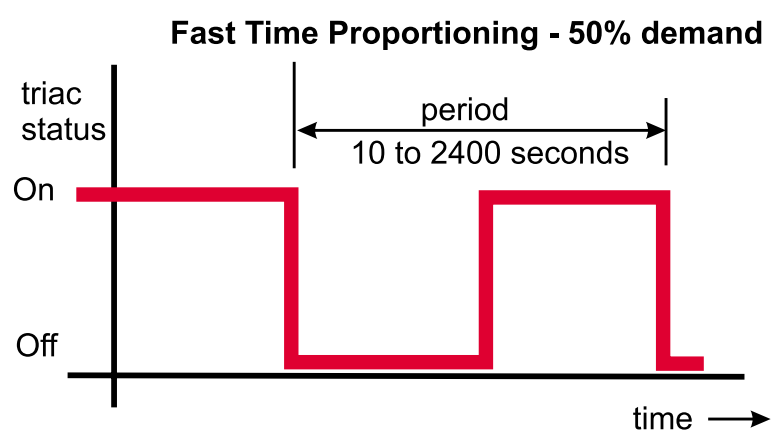
- if we switch motors On and Off repeatedly too frequently, they can become damaged. It is therefore important to set the **Minimum-On TIme** for the Driver, which will prevent the Module from switching On the device, and then immediately switching it off again at times of light load. This setting also sets the Minimum-Off Time, to prevent similar problems at near-100% load conditions.
- Minimum-On Time can be set using Set-up Mode, see Design and Commissioning Guide, or by setting a Configuration Parameter - PERD, HPRD or CPRD depending on the Module. The setting is in 10's of seconds i.e a value of 1 = 10 seconds)
- the **Period** of the Driver, i.e. the time taken for one complete On/Off cycle - set automatically to10x Minimum-On Time.
- the Minimum-On Time can be set from 1 (10 seconds) to 240 (40 minutes) to cover diverse applications.



Fast Time Proportioning Drivers

what are they ?

- Fast Time Proportioning Drivers are, like Time Proportioning Drivers, for driving On/Off devices in a way that will give a form of proportional control over the load they are feeding.
- Fast TP drivers are specifically to drive Electric Heater Batteries, especially batteries which are in a forced air stream, like AHU batteries, because they heat up and cool down relatively quickly. They are not suitable for driving other on/off devices like valves or motors. Because they switch the load so rapidly, they give virtually **continuous control** over the load.
- Fast Time Proportioning Drivers use a single Triac output; Relays are not suitable because the switching is too rapid.
- when the device is on, it is supplying 100% energy to the load. When it is off, it is supplying 0% energy. If we can turn the device On and Off repeatedly, and control the ratio of "On" time to "Off" time, we can control the energy input between 0 and 100%.



- we need to use an external device to switch the large current load; a contactor is not suitable because it would soon be damaged by the rate of switching. We use a **Solid State Relay** (SSR) which can switch large currents rapidly because it has no moving parts. Make sure you buy one with **Zero Phase Crossover Switching** ; this will ensure that Electromagnetic noise is kept to a minimum.
- this technique typically gives identical performance to Thyristor Drives but at much lower cost
- Minimum-On Time is not relevant with Fast TP drivers, so the Parameter settings - PERD, HPRD or CPRD depending on the Module, are used to set the **Period** of the Driver, i.e. the time taken for one complete On/Off cycle. Normally this does not need to be adjusted, because it is significantly shorter than the time response of the load. The setting is in seconds, i.e a value of 1 = 1 second.
- the period can be set from 1 (1 seconds) to 240 (4 minutes) to cover diverse applications.

Sequenced Drivers

what are they ?

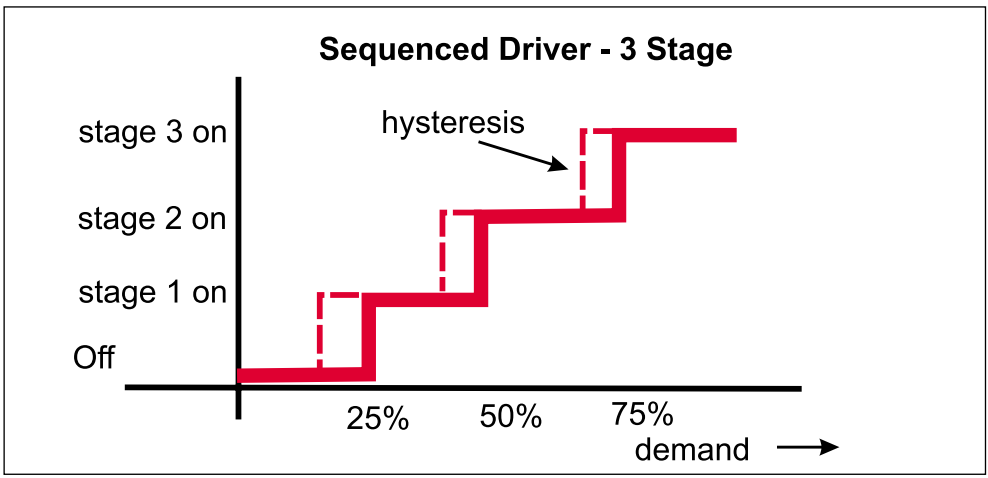
- Sequenced Drivers are used to drive loads which have multiple stages. Sequenced Drivers can give proportional control using a number of relay or triac outputs, or a single analogue output driving an external relay module.
- examples of typical loads are staged electric heater batteries, staged extract fans etc.

Hysteresis

- as the output demand in the Module rises, so more stages will be brought on. An automatic **Hysteresis** function ensures that, if demand hovers around the switching point of any stages. The stage is not rapidly switched on and off.

Time Proportional action

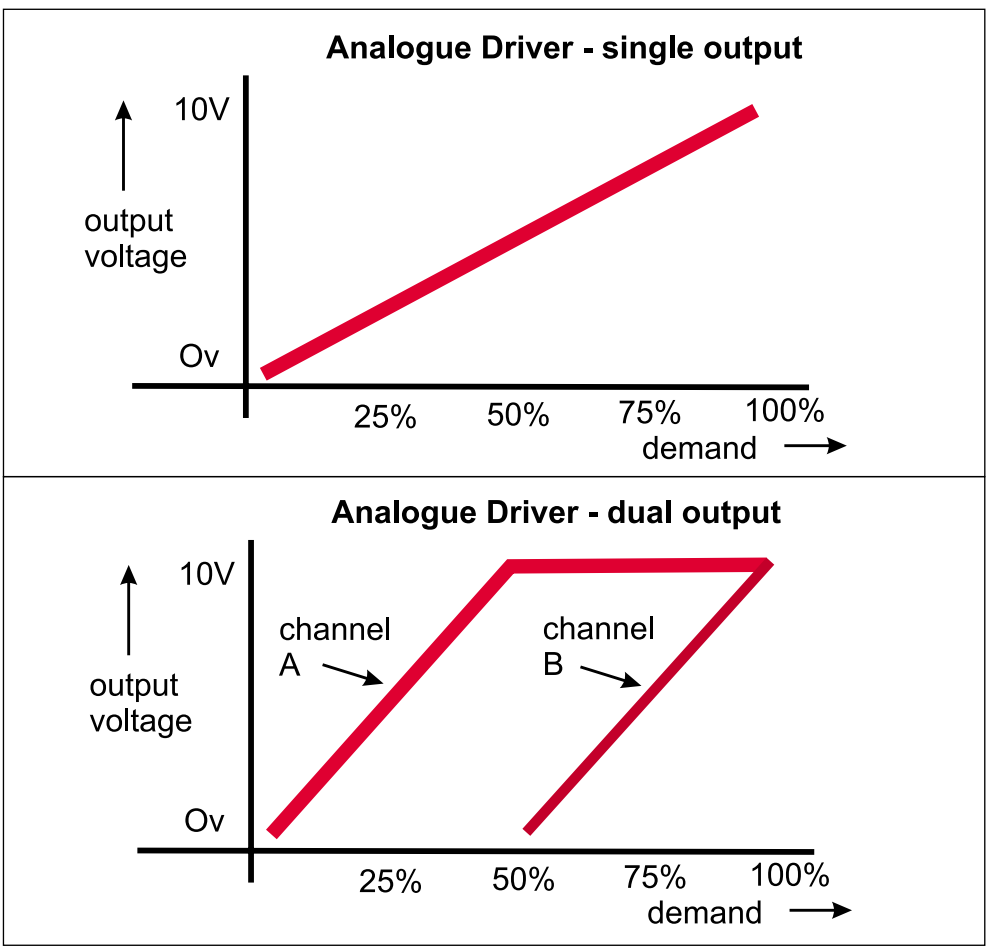
- as output demand rises above the switching threshold for the next stage, the new stage will not turn on continuously, but will **Time-Proportion** its output, see description of Time Proportioning Drivers. This gives a greater degree of proportionality over the load than a simple On/Off sequence. The Time Proportional Minimum-On Time may be set on the PERD, HPRD or CPRD parameter as for the TP Driver.



Analogue Drivers

what are they?

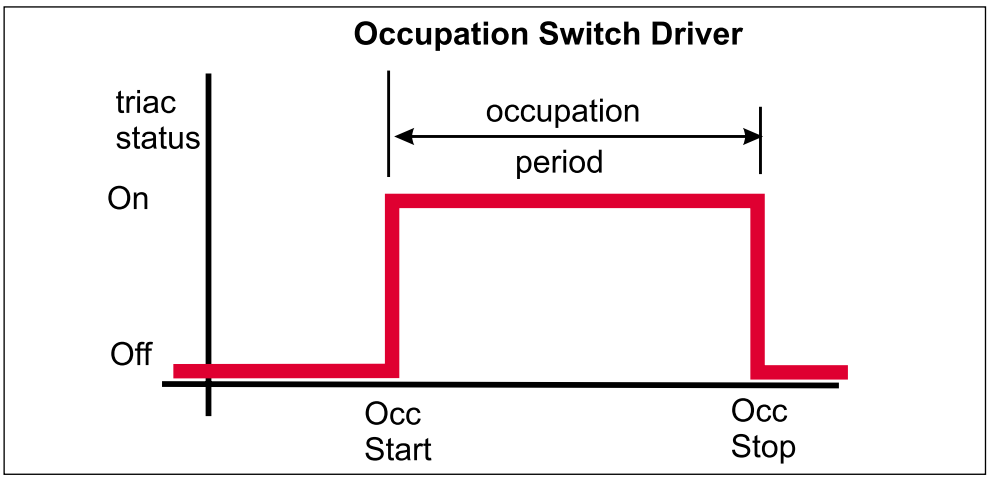
- Analogue Drivers drive devices with 0-10V DC inputs
- typical load examples are control valves, damper actuators, variable speed drives, thyristor controls for electric heaters.
- Analogue Drivers use either 1 or 2 Analogue outputs. If they only use one of the two outputs, the other output can have a different Driver Type, which can be used in conjunction with an interface module to enable valve/pump or valve/fan combinations.



Occupation & Optimum Start Switch Drivers

what are they?

- Optimum Start and Occupation Switch Drivers are used to control outputs that need to switch on the basis of Occupancy Times, rather than on an energy demand basis.
- examples of typical loads are Extract Fans which need to run at certain times, DHW Secondary pumps which need to run for the whole Occupation period etc.
- Occupation/Optimum Start Switches use a single relay or triac output, or a single Analogue output with an external relay module.
- the Occupation Switch will turn on the output when Occupation Start occurs - Start 1 time on the Zone Controller, and remain on for the whole of the Occupation period. It will de-energise at Occupation Stop - Stop 1 time on the Zone Controller. Optimum Stop - whether in use or not, is ignored. If a second Occupancy period has been set for the day, the output will turn on at Start 2 time, and off again at Stop 2 time.
- the Optimum Start Switch will turn on the output when Optimum Start for the first Occupation Period, i.e. prior to or coincident with Start 1 time on the Zone Controller, and remain on for the whole of the Occupation period. It will de-energise at Occupation Stop - Stop 1 time on the Zone Controller. Optimum Stop - whether in use or not, is ignored. If a second Occupancy period has been set for the day, the output will turn on at Optimum Start for the second Occupancy period, and off again at Stop 2 time.
- you can decide which sort of switch to use at time of commissioning, because you can select Optimum Start or Occupation Switch using the OCCO Parameter.



Universal Driver Parameters

Most triac output (3T) modules and analogue output (AOP) modules use the SeaChange universal driver to configure the outputs. The standard output Driver types available are shown in the table.
The Configuration parameters that correspond are shown in the table opposite The Parameters can be changed from InSite or Doorway but not from the Zone Controller
The modules which use these standard output Drivers are:
Chiller Controllers, Secondary Circuit Controllers, AHU Preheater submodule, Actuator submodules, DHW Controller, Pool Controller, Door Heater controller
Example: DHW/DIN/3T/**105**

Universal Driver Types

Heating Only	Cooling Only	Heating & Cooling	Triac Outputs Triac A	Triac B	Triac C
101	201		TP	Not used	Occ/Oss Switch
105	205		Raise	Lower	Occ/Oss Switch
108	208		Stage 1	Stage 2	Occ/Oss Switch
109	209		Stage 1	Stage 2	Stage 3
110			TP	Immersion Heater	Occ/Oss Switch
111			Raise	Lower	Immersion Heater
		313	TP Heating	TP Cooling	Occ/Oss Switch
421	521		Fast TP	Not Used	Occ/Oss Switch
422	522		Fast TP 0-50%	Fast TP 50-100%	Occ/Oss Switch
			Analogue Outputs **Output A**		**Output B**
701	801		TP		Occ/Oss Switch
705	805		Raise/Lower		Occ/Oss Switch
721	821		0-100%		Occ/Oss Switch
722	822		0-50%		50-100%
731	831		2 Stage Sequenced		Occ/Oss Switch
732	832		3 Stage Sequenced		Occ/Oss Switch
733	833		8 Stage Sequenced		Occ/Oss Switch
		921	0-100% Heating		0-100% Cooling
		941	TP Heating		Raise/Lower Cooling
		942	Raise/Lower Heating		TP Cooling

Universal Driver Configuration Parameters

Parameter No. Mnemonic 3T	AOP	C150 HTYP	C151 HSTG	C152 CTYP	C153 CSTG	C154 FTYP	C155 FSTG
101		2	1	0	0	6	1
105		1	2	0	0	6	1
108		2	2	0	0	6	1
109		2	3	0	0	0	0
110		2	1	2	1	6	1
111		1	2	2	1	0	0
201		0	0	2	1	6	1
205		0	0	1	2	6	1
208		0	0	2	2	6	1
209		0	0	2	3	0	0
313		2	1	2	1	6	1
421		3	1	0	0	6	1
422		3	2	0	0	6	1
521		0	0	3	1	6	1
522		0	0	3	2	6	1
623		3	1	3	1	6	1
	701	2	1	0	0	6	1
	705	1	2	0	0	6	1
	721	4	1	0	0	6	1
	722	4	2	0	0	6	1
	731	2	2	0	0	6	1
	732	2	3	0	0	6	1
	733	2	8	0	0	6	1
	801	0	0	2	1	6	1
	805	0	0	1	2	6	1
	821	0	0	4	1	6	1
	822	0	0	4	2	6	1
	831	0	0	2	2	6	1
	832	0	0	2	3	6	1
	833	0	0	2	8	6	1
	921	4	1	4	1	0	0
	941	2	1	1	2	0	0
	942	1	2	2	1	0	0

Universal Driver Types
for specific modules

	3T Output A	3T Output B	3T Output C	AOP Output A	AOP Output B
Fan Coils					
FCU/DIN/3T/001	Heating Raise	Heating Lower	Fan Enable		
FCU/DIN/3T/002	Cooling Raise	Cooling Lower	Fan Enable		
FCU/DIN/3T/003	Damper Open	Damper Close	Fan Enable		
FCU/DIN/3T/004	Heating TP	Cooling TP	Fan Enable		
	Heating Output	**Cooling Output**	**Fan Outputs**		
FCU/DIN/4R/001	Raise/ Lower	Raise/ Lower	N/A		
FCU/DIN/7R/001	Raise/ Lower	Raise/ Lower	3 Speed		
FCU/DIN/7R/002	TP	Raise/ Lower	3 Speed		
FCU/DIN/7R/101	Raise/ Lower	Raise/ Lower	Single Speed		
FCU/DIN/7R/102	TP	Raise/ Lower	Single Speed		
FCU/DIN/7R/201	Raise/ Lower	Raise/ Lower	Dual Speed		
FCU/DIN/7R/202	TP	Raise/ Lower	Dual Speed		
Floor Controller					
FLR/DIN/6R/001	3 Stages	3 Stages	N/A		
VAV Controllers					
VAV/DIN/AOP/001				0-100% Reheat	0-100% Volume Setpoint
VAV/DIN/AOP/002				0-100% Reheat	0-100% Volume Setpoint

	3T Output A	3T Output B	3T Output C	AOP Output A	AOP Output B
AHU Sub Modules					
Mixing Damper submodule					
DAM/DIN/3T/001	Damper Open	Damper Close	Not Used		
DAM/DIN/AOP/001				0-100% Damper Position	Not Used
DAM/DIN/AOP/002				0-100% Damper Position	Not Used
Heat Recovery submodule					
HRC/DIN/3T/001	TP	Not Used	Occ/Oss Switch		
HRC/DIN/3T/006	Raise	Lower	Occ/Oss Switch		
HRC/DIN/3T/008	Stage 1	Stage 2	Occ/Oss Switch		
HRC/DIN/3T/009	Stage 1	Stage 2	Stage 3		
HRC/DIN/AOP/001				0-100% Recovery	Not Used
HRC/DIN/AOP/002				0-100% Thermal Wheel	0-100% Evaporative Cooler
HRC/DIN/AOP/003				0-100% Desiccant Wheel	0-100% Regen Heater
Humidity submodule					
HUM/DIN/3T/008	Stage 1	Stage 2	Not Used		
HUM/DIN/3T/009	Stage 1	Stage 2	Stage 3		
HUM/DIN/AOP/001				0-100% Humidity	Not Used
Static Pressure submodule					
SPC/DIN/AOP/001				0-100% Speed	Not Used
Pump Speed Boiler submodule					
PSC/DIN/AOP/001				0-100% Speed	Not Used

Driver Configuration Parameters
specific modules

Parameter Number Mnemonic	C150 HTYP	C151 HSTG	C152 CTYP	C153 CSTG	C154 FTYP	C155 FSTG
DAM/DIN/3T/001	1	2	1	0	0	0
DAM/DIN/AOP/001	4	1	4	0	0	0
DAM/DIN/AOP/002	4	1	4	0	0	0
FCU/DIN/3T/001	1	2	0	0	6	1
FCU/DIN/3T/002	0	0	1	2	6	1
FCU/DIN/3T/003	1	2	1	0	6	1
FCU/DIN/3T/004	1	2	1	0	6	1
FCU/DIN/4R/001	5	3	5	3	0	0
FCU/DIN/7R/001	5	3	5	3	7	3
FCU/DIN/7R/002	5	1	5	3	7	3
FCU/DIN/7R/101	5	3	5	3	7	1
FCU/DIN/7R/102	5	1	5	3	7	1
FCU/DIN/7R/201	5	3	5	3	7	2
FCU/DIN/7R/202	5	1	5	3	7	2
FLR/DIN/6R/001	2	3	2	3	0	0
HRC/DIN/3T/001	2	1	2	0	6	1
HRC/DIN/3T/006	1	2	1	0	6	1
HRC/DIN/3T/008	2	2	2	0	6	1
HRC/DIN/3T/009	2	3	2	0	0	0
HRC/DIN/AOP/001	4	1	4	0	0	0
HRC/DIN/AOP/002	4	1	4	0	0	0
HRC/DIN/AOP/003	4	1	4	0	0	0
HUM/DIN/3T/008	2	2	0	0	0	0
HUM/DIN/3T/009	2	3	0	0	0	0
HUM/DIN/AOP/001	4	1	0	0	0	0
PSC/DIN/AOP/001	4	1	0	0	0	0
SPC/DIN/AOP/001	4	1	4	1	0	0
VAV/DIN/AOP/001	4	1	4	1	0	0
VAV/DIN/AOP/002	4	1	4	1	0	0

AHU Controller Driver Configuration Parameters

Parameter Number Mnemonic	Type	C150 HTYP	C152 CTYP
Raise/Lower Heating & Cooling	WW	1	1
Raise/Lower Heating & Electric Cooling	WE	1	2
Electric Heating & Raise/Lower Cooling	EW	2	1
Electric Heating & Electric Cooling	EE	2	2

Self-Tuning Control Loops

what is Self-Tuning?

- SeaChange Modules are application-specific; they have the application software embedded in them at the SeaChange factory. Because of this, we can make the modules ready for their task, not just with the correct software algorithms for the task, but also with the correct dynamic performance when they are set to work.
- Modules are shipped with parameters in their control loops which are set to appropriate values for the task they have to perform - the parameters in a DHW Controller will be quite different to those set for a Static Pressure Controller, for instance, because of the different time constants involved in the two processes).

Fuzzy Logic

- once the Module is commissioned, **Self Tuning** takes over. SeaChange Modules do not employ traditional 3-Term (Proportional-Integral-Derivative or PID) control loops, they use **Fuzzy Logic** loops. Fuzzy Logic is a more flexible technique which allows “weighted” **rules** to apply to the algorithm, instead of the 3 fixed terms in the PID expression. Rules in the SeaChange loops include Deviation from setpoint (error), Integral of error, and Rate of Change of Process Variable.

Self Tuning

- the Fuzzy Logic Loops will adapt, or Self Tune, their parameters in order to refine those set at our factory for the particular application. This process occurs continually, and will adjust for seasonal changes, differences in plant performance etc. - although it cannot compensate for inadequately-sized plant, valves with the incorrect authority over their loads, or serious mechanical faults etc.

Parameters

- the tuning parameters are accessible to an engineer, but should never normally require adjustment. If adjustment should prove necessary, this should always be done in conjunction with a SeaChange Engineer.

Auto Configuration

what is Auto Configuration?

- SeaChange Modules can **Auto-Configure**; this means that the Module will survey its input connections - usually whether or not a sensor is present, and configure its application software accordingly.
- for example, if a Boiler Controller does not have a VT sensor fitted, it will assume that no VT Valve is present, and will automatically weather-compensate the Primary Circuit instead of the Secondary Circuit.

Dynamic operation

- often, Modules are able to Auto-Configure dynamically during normal operation, which can give 'graceful degradation' rather than instant failure of a system if sensors fail etc.
- many Modules have this kind of feature and are described in the Module Data Sheet

Doorway Codes

General Principles

To get data from a SeaChange system, Doorway uses data requests of the form:

	[Address field]	Parameter field	(Data field)
for example:	[Z1]	S1	($,V)

will return the 4-character label ($) ROOM from a Zone Controller (address Z1, parameter S1), and its current temperature value (V). It will appear thus:

ROOM 22.3

These codes must be entered onto a Doorway page using Doorway's Edit Mode.

If you want to add engineering units, this can be done by adding text after 3 forward slashes; the syntax now becomes:

[Z1]S1($,V)/// degC

will return the following screen display:

ROOM 22.3 degC

The font size and colour and many other aspects of the visual appearance may be adjusted; see Doorway's on-line Help facility for further details.

Parameters and click-action

Several different types of parameter from a Module can be displayed at Doorway; some of these parameters are read-only, some are adjustments. Doorway gives the correct sort of *click-action* (i.e. what happens when you click on the point on the screen) for each different type of parameter.

Types are as follows:

Para-meter	Description	click-action
S	Sensor; an analog value, read-only (e.g. current temperature)	gives graph (if available)
K	Knob; an adjustable analogue value (e.g Setpoint)	gives adjustment dialog box
I	Input; a digital (on/off) status point (may actually refer to an output relay status, rather than an input)	none
W	sWitch; an adjustable digital (on/off) value (e.g. Auto/Manual)	gives on/off adjustment dialog box
C	Configuration Parameter; an adjustable analogue value (usually a commissioning setting)	gives adjustment dialog box

For a list of parameters for a particular module, see the Data Sheet for that module

Main Module Addresses:

Address field	Controller
[Z*n*]	Zone, DHW or Fan Coil controllers
[A*n*]	AHU controller
[H*n*]	Secondary Circuit Controller (Heating)
[C*n*]	Secondary Circuit Controller (Cooling)
[B1]	Boiler or Floor Controller
[S*n*]	Serial Adaptor
[M*n*]	Monitoring Module

n = Main Module Address Number

Submodule address examples:

Zone Controller Submodules:

[Z1A1] 1st Actuator or Changeover registered to Zone1

AHU Controller Submodules:

[A1M1] Mixing Damper or Heat Recovery Controller registered to AHU1

[A1P1] Preheater registered to AHU1

[A1F1] Fan Changeover or Static Pressure Controller registered to AHU1

[A1H1] Humidity Controller registered to AHU1

Boiler or Floor Controller Submodules:

[B1C1] Cascade Module registered to Boiler Controller B1

[B1A1] Actuator Controller registered to Boiler Controller B1

[B1P1] Pump Changeover registered to Boiler Controller B1

Secondary Circuit Controller Submodules:

[H2A1] Actuator or Changeover registered to Heat Source 2

[C3A2] Actuator or Changeover registered to Cool Source 3

Multi - Domain Systems:

For Multiple Domain systems, the address field is prefixed by the Domain number:

e.g. **[D3Z1]**S1($,V) will return data from Zone 1 on Domain 3

Commissioning Tips

Power-up checks

- Apply 230V ac to the system power supplies.
- After a few seconds, the controllers will have performed their power-up checks, and will be showing at least one lit indicator lamp. If they are not lit, or if they are behaving erratically, this indicates a network wiring fault or insufficient power available. Check the network wiring and the power consumption calculations. Check the network voltage at each controller; the nominal voltage is 42.4V DC; anything less than 35V indicates a fault
- The PSU has a Network Fault light; if it is illuminated there is a partial short to earth on the Network which must be eliminated.

Registration

- This should be carried out next - see Registration section of this guide. Do not attempt Registration without the Interconnect Drawing. If modules repeatedly fail to register, there may be a network wiring problem - excessive length or poor connections.

Configuration Parameters and Static Checks

- Now set the Configuration Parameters that need to be set for your application
- Use the Monitoring Parameters to view all sensors connected to the system to make sure they are reading correctly. Temporarily disconnect each sensor at the field end; press the select button on the Zone Controller to refresh the display - the reading should revert to an open-circuit reading, normally a negative value. Now reconnect the sensor, refresh the display to see the sensor reading return. This proves that the correct sensor is wired to each input channel.
- Use Set-up Mode to set valve stroke times or Minimum-on times for outputs, or alternatively set the times using the period parameters.
- Use Override Mode to check that outputs drive correctly

Setting the System to work

- Set the System Clock to current Time and Day from any Zone Controller
- Set the desired Occupation Times, Setpoints and Setpoint Adjustment ranges for each Zone Controller
- Check that the system responds correctly when the Zone Controller is put into Occupation - don't forget to allow for start-up or run-on time delays.
  Sub-Modules registered to that Zone should display their "Occupied" status lamp when the Zone is occupied.
- Check that the system responds correctly to setpoint changes for heating and cooling - don't expect an immediate response from the control loops.
- Manual Mode can be used to check that the system responds correctly to Demands. This speeds up the commissioning process.
  Set Parameter HAND to select Manual Mode
  Use Parameter MANL to determine Manual Level

Documentation

- Keep a note of all addresses, Interconnects and Configuration Parameter changes so that you can complete the documentation using the Interconnect Tool or use InSite to automatically document the As Installed System

Code	Parameter
AAON	Alarm Mode A
AAST	Input A Alarm Status
ACH1	Analogue Input 1
ACH2	Analogue Input 2
ACH3	Analogue Input 3
ACH4	Analogue Input 4
ACH5	Analogue Input 5
ACH6	Analogue Input 6
AHDY	High Alarm A Delay
AHGH	High Alarm Level A
AJSP	Adjust Stop Time
AJST	Adjust Start Time
ALDY	Low Alarm A Delay
ALMA	Input A Alarm State
ALMB	Input B Alarm State
ALMC	Input C Alarm State
ALMC	Alarm Relay Status
ALMD	Input D Alarm State
ALME	Input E Alarm State
ALMF	Alarm Filter
ALMS	Sounder Status
ALOW	Low Alarm Level A
ALRM	Alarm Mode
ALST	Alarm State
AMON	Monitor Alarms
AREM	All Boilers Remote
ARST	Alarm Reset Input Status
ASAC	All STOP Action
ATYP	Input A Channel Type
AUTO	Automatic mode
AVDM	Average Demand
AVDP	Average Wind Direction period
AVWD	Average Wind Direction
AVWP	Average Wind Speed period
AVWS	Average Wind Speed
BAON	Alarm Mode B
BAST	Input B Alarm Status
BAUD	Baud Rate (0=9600/ 1=19200/ 2=2400)
BHDY	High Alarm B Delay
BHGH	High Alarm Level B

Code	Parameter
BLDY	Low Alarm B Delay
BLOK	Number of Boilers OK
BLOP	Boiler Demand
BLOW	Low Alarm Level B
BLRA	Boiler 1 Status
BLRB	Boiler 2 Status
BLRS	Number of Boilers
BOXV	Box Volume %
BRON	Primary Pump Run on (mins)
BTYP	Input B Channel Type
C DP	Decimal Places
C NS	Healthy State
C OS	Channel Offset
CALM	Common Alarm Enable
CAON	Alarm Mode C
CAST	Input C Alarm Status
CBTM	Engineering Value at 0 V input
CDLY	Cooling Interlock Delay (mins)
CDMD	Cooling Demand
CDRV	Cooling Driver Input
CGST	Configuration mode
CHDY	High Alarm C Delay
CHGH	High Alarm Level C
CHNL	Channel to be Configured
CINP	Configure Selected Input
CINT	Internal Cooling Stages
CLCT	Cooling Demand sent as CT
CLDY	Low Alarm C Delay
CLIP	Cool Demand from AHU
CLOP	Cooling Output
CLOW	Low Alarm Level C
CLRS	Clear STOP Alarm
CLSC	Cool Source
CLWR	Cool Lower
CMAL	Common Alarm State
CMDE	Control Mode
CNDF	Condensation Detected
COMP	Compensator Offset
COND	Condensation detected
CONN	Connection Type
COOL	Cooling Mode

Code	Parameter
COPY	Copy Current Channel to
COUT	Supply Loop Cooling Output
CPRD	Cooling Driver Stroke /Min On Time (secs/10)
CRMN	Cooling Rescale Minimum
CRMX	Cooling Rescale Maximum
CRNG	Compensator Adaptive Trim Range
CRSE	Cool Raise
CSTG	Cooling Stages
CTMP	Cooling Temperature
CTOP	Engineering Value at 10V input
CTRA	Current Transformer Ratio A
CTRB	Current Transformer Ratio B
CTYP	Input C Channel Type
CTYP	Channel Type (0=AI/1=DI)
CTYP	Cooling Driver Type
CUTS	Supply Air Cut Off temperature
DAON	Alarm Mode D
DAST	Input D Alarm Status
DCAL	Wind Direction Calibration (degrees)
DE1A	count this period A
DE1B	count this period B
DEGF	Display Temperatures in degF
DEGR	Max Temperature Rise Across Battery
DHDM	DeHum Demand from Humidity Controller
DHDY	High Alarm D Delay
DHGH	High Alarm Level D
DHOF	Supply DeHum Setpoint Offset
DHOF	DeHum Demand from Humidity Controller
DHWP	DHW Priority
DISP	Default Display
DLAY	Flow Proving Delay (secs)
DLDY	Low Alarm D Delay
DLOW	Low Alarm Level D

Code	Parameter
DLYO	Alarm Delay Mode
DMND	Control Demand
DMPC	% of AHU demand used for Dampers
DOFF	Offset added to Outside Temp for ReGen SP
DOMN	Own Domain
DTYP	Input D Channel Type
EAON	Alarm Mode E
EAST	Input E Alarm Status
EFAN	Extract Fan Status
EHDY	High Alarm E Delay
EHGH	High Alarm Level E
ELDY	Low Alarm E Delay
ELOW	Low Alarm Level E
EN A	Enable Pump A
EN B	Enable Pump B
ESTF	Establish Flow
ETYP	Input E Channel Type
EXTI	External Input State
EXTN	External Input
FAIL	Pump/Fan Fail
FANF	Fan Fail
FDRV	Fan-Pump Driver Input
FL A	Flow Pump A
FL B	Flow Pump B
FLAV	Flow Setpoint for 10C OAT
FLFA	Flow Fail Pump A
FLFB	Flow Fail Pump B
FLOW	Flow Temperature
FLSP	Current Flow Setpoint
FLTF	Filter Blocked
FMD	Failure Mode
FMDE	Fan Mode
FOFF	Fan Speed Offset between outputs
FPRD	Fan/Pump period (secs/10)
FREZ	Danger of Freezing Alarm
FROS	Frost Protection in Progress
FRPT	Frost Mode
FRSE	Fabric/Frost Rise

Code	Parameter
FRSP	Frost/Fabric Protection Setpoint
FRST	Frost Protection
FSMD	Fan Switch Mode (with Sontay Switch)
FSTG	Fan/Pump Stages
FSWM	Sontay Fan Speed Mode
FTYP	Fan Pump Type
GAIN	CT Setpoint Offset (pipework gain)
GENA	General Alarm A
GENB	General Alarm B
GRP	Own Group
HAND	Manual HAND Mode
HAON	Humidity Alarm Mode
HCOK	Simultaneous Heating and Cooling Allowed
HCOP	Heat/Cool Output (cooling negative)
HDLY	Heating Interlock Delay (mins)
HDMD	Heating Demand
HDRV	Heating Driver Input
HHDY	Remote Humidity High Alarm Delay
HHGH	High Alarm on Average Remote Humidity
HILM	DHW High Limit Exceeded
HINT	Internal Heating Stages
HLDY	Remote Humidity Low Alarm Delay
HLOW	Low Alarm on Average Remote Humidity
HOUT	Supply Loop Heating Output
HPRD	Heating Driver Stroke /Min On Time (secs/10)
HRMN	Heating Rescale Minimum
HRMX	Heating Rescale Maximum
HRSA	Hours Run Pump A
HRSB	Hours Run Pump B
HSEL	Heating Selected
HSTG	Heating Stages

Code	Parameter
HTCT	Heating Demand sent as CT
HTIP	Heat Demand from AHU
HTMP	Heating Temperature
HTOP	Heating Output
HTSC	Heat Source
HTYP	Heating Driver Type
HWOP	Hot Water Output
HWRO	DHW Run on Time (hours)
HWSP	Hot Water Setpoint
HWT2	Hot Water Top Temperature
HWTP	DHW Temperature
ICGN	Inter Coil Gain
ICSP	Inter Coil Setpoint (read only)
ILKA	Interlock Block A
ILKB	Interlock Block B
ILKC	Interlock Block C
ILKD	Interlock Block D
ILKP	Interlock Pump
IN A	Input A Status/Value
IN B	Input B Status/Value
IN C	Input C Status/Value
IN D	Input D Status/Value
IN E	Input E Status/Value
INCL	Inter Coil Temperature
INLK	Driver interlock
INMD	Input Mode
INPA	Input A
INPB	Input B
INVD	Invalid config. Settings
ISS3	Force Issue 3 compatibility
IV0A	initial value meter A lower four digits
IV0B	initial value meter B lower four digits
IV1A	initial value meter A upper four digits
IV1B	initial value meter B upper four digits
KW0A	lower four digits meter A
KW0B	lower four digits meter B
KW1A	upper four digits meter A

Code	Parameter
KW1B	upper four digits meter B
LOFL	Low Flow (used with SUMR)
LOKA	Lockout Boiler 1
LOKB	Lockout Boiler 2
LOSS	CT Setpoint Offset (allow for pipe loss)
MAMX	Select Min/Average/Max for transmission
MANL	Manual Level
MAXC	Maximum Cooling Setpoint
MAXF	Maximum flow temperature Setpoint
MAXH	Maximum Heating Setpoint
MAXS	Maximum Supply air setpoint
MAXV	Maximum Box Volume
MBNO	MiniBar Use while Room Not Let
MBOC	MiniBar Use while Room Let
MHOL	Master Holiday
MIDP	Mid Point for Airside Dampers
MIN	Boiler Min Run Time (mins)
MINC	Minimum Cooling Setpoint
MIND	Minimum Demand
MINF	Minimum flow temperature Setpoint
MINH	Minimum Heating Setpoint
MINR	Minimum Return Temp.
MINS	Minimum Supply air Setpoint
MINV	Minimum Box Volume
MNAQ	Air Quality Reading for Min Fresh Air
MNAV	Minimum Average Demand %
MNCT	Minimum CT Setpoint
MNDV	Minimum Driver Demand
MNFA	Minimum Fresh Air
MNKP	Minimum Sensor Scaling
MNOC	Minimum number of Occupied Zones
MNON	Minimum ON/OFF time (mins)
MNOP	Minimum Output
MNSH	Min Supply Humidity

Code	Parameter
MNVA	Min Voltage channel A
MNVB	Min Voltage channel B
MODD	Modulate Valve
MODE	Mode (see data sheet)
MODM	Modem Type
MOVR	Master Override
MRUN	Minimum Run Time (mins)
MTRA	Meter Reading A
MTRB	Meter Reading B
MXAQ	Air Quality Reading for Max Fresh Air
MXCT	Maximum CT setpoint
MXDM	Max Zone Demand
MXDY	Max OFF time before pump exercise (days)
MXHR	Max Hours Run before changeover
MXKP	Maximum Sensor Scaling
MXOF	Maximum Optimum Off (hours)
MXOS	Maximum Optimum Start (hours)
MXSH	Max Supply Humidity
MXVA	Max Voltage channel A
MXVB	Max Voltage channel B
MXVT	Maximum VT Temperature
MZON	Master Zone
NALM	Alarm Mute
NOAL	No Alarms
NOCC	Number Zone Occupied
NOSP	Non occupied setpoint
NOSV	Non Occupied Supervised Setpoint
NPMP	Number of Pumps
NRPL	Suppress First Missed Message
NTCL	Night Cool down setpoint
OCC	Occupied
OCCD	Occupied
OCCO	Occupied Only
OCDS	Occupation Destination
OCSP	Occupied Setpoint

Code	Parameter
OMNC	Outside Min Cooling
OMNH	Outside Min Heating
OMXC	Outside Max Cooling
OMXH	Outside Max Heating
OOFF	Optimum Off in Operation
OPOK	Last Optimum Start Completion
OPST	Last Optimum Start Time
OPTE	Optimum Start Error Allowance (droop)
OSRT	Optimum Start in Operation
OUTF	Outside Temperature Failed
OUTH	Outside Humidity
OUTS	Outside Temperature
OVRD	Override Mode
PERD	Valve Stroke Time
PMPA	Pump A Status
PMPB	Pump B Status
PN A	Plot Channel A Logs
PN B	Plot Channel B Logs
PN C	Plot Channel C Logs
PN D	Plot Channel D Logs
POT	Manual Potentiometer Fitted
PPKA	Pulses per KWh Channel A
PPKB	Pulses per KWh Channel B
PPMP	Primary Pump Status
PT A	Plot Channel A Period
PT B	Plot Channel B Period
PT C	Plot Channel C Period
PT D	Plot Channel D Period
PVKP	Measured Pressure
RAMP	Maximum Rate of Fan Speed Change
RCFG	Remote Configuration
RCLR	Remote Reset of Common Alarm
RDLY	Recirculation Delay
RDMD	Recirculation Demand
REHT	Re Heat Mode (max volume in Re Heat)
REQD	Required Temperature (Setpoint)
RHDB	Relative Humidity Deadband %
RHSP	De-Humidification Setpoint %RH
RHUM	Relative Humidity %
RLET	Room Let
RLYA	Relay A Status
RLYB	Relay B Status
RLYC	Relay C Status
RLYD	Relay D Status
RLYE	Relay E Status
RLYF	Relay F Status
ROOM	Room Temperature
RPLN	Replace Missing Nodes Enabled
RPVF	Remote Process Variable Failed
RQKP	Required Pressure
RSAM	Remote Sensor Alarm Mute
RSET	Reset Fan Fail
RSTA	Reset Hours Run Pump A
RSTB	Reset Hours Run Pump B
RTNA	Return Temperature
RTNH	Return Air Humidity
RTRH	Return RH %
RTRN	Return Temperature
RTRY	Retry Delay after Fan Fail (hours)
RTSP	Return RH Setpoint
RUNO	Pump Run On
RXTO	Network Reply Timeout
SACT	Sensor Action
SBDB	Standby Deadband
SCAL	Sensor Calibration
SENF	Sensor Fail
SERV	Generate Service Pin message
SFAN	Supply Fan Status
SFRT	Supply Fan Starts First
SHOF	Heating Disabled (Summer Cut off)

Code	Parameter
SLRH	Supply RH %
SLSP	Supply RH Setpoint
SLVM	Slave Mode
SMRT	Summer Heating Inhibit
SPAH	Setpoint Air Handler
SPAJ	Immediate Setpoint Knob Adjustment Range
SPDB	Setpoint Deadband
SPDF	Update Default Setpoint
SPFC	Setpoint Fan Coil
SPFR	Frost/Fabric protection setpoint
SPKP	Occupied Setpoint
SPLA	Supply Air Temperature
SPLH	Supply Air Humidity
SPMD	Midpoint of Setpoint Adjustment
SPMX	Maximum Temperature
SPNO	Non Occupied Setpoint
SPOC	Occupied Setpoint
SPRG	Setpoint Adjustment Range
SPRH	Humidity Setpoint
SPRT	Return Air Setpoint
SPSL	Supply Setpoint
SPSV	Supervised Setpoint
SPTR	Setpoint Trim
SPTY	Setpoint Type
STAT	Thermostatic Control Mode
STBY	Room Standby
STOP	System STOP Alarm
SUMR	Summer Immersion Heater Temperature
SUPF	Supply Sensor Failed
TAON	Temperature Alarm Mode
TEMP	Measured Temperature
THDY	Remote Temp. High Alarm Delay
THGH	High Alarm on Average Remote Temp.
TLDY	Remote Low Temp. Alarm Delay
TLOW	Low Alarm on Average Remote Temp
TRGT	Target for Humidifier Average Output
TRND	Send IC Comms to TREND
TRNG	Compensator Proportional Trim Range
TRRG	Trim Pot Range
TYPE	Controller Type
VLIM	VT Valve Limit
VMDE	DHW Control Valve Mode
VPMP	VT Pump Status
VTCL	VT Valve Closing
VTMP	VT Circuit Temperature
VTOP	VT Valve Opening
VTPN	VT Valve Position
VTSP	VT Setpoint
WBFT	Wind Speed Beaufort Scale
WCAL	Wind Speed Calibration
WKNT	Wind Speed (knots)
WMPH	Wind Speed (mph)
WMUP	Warm Up
WNDD	Wind Direction
WNDS	Wind Speed (m/sec)
XHRS	Hours Extension when Override pressed
XOCC	External Occupation Signal
ZBST	Zone Boost Enabled
ZDMD	Max Zone Demand

Thermistor Table

The following table shows temperature v resistance in Ohms for the tight tolerance (+/-0.2^{degC}) negative temperature coefficient thermistor used in SeaChange products
Uses Thermistor Type 10k3A1

Temp ^{degC}	Resistance	Temp ^{degC}	Resistance	Temp ^{degC}	Resistance
-50	667828	19	13053		
-40	335671	20	12494	100	678.6
-30	176683	21	11943	105	587.3
-20	96974	22	11420	110	510.1
-10	55298	23	10923	115	444.5
-5	42314	24	10450	120	388.6
		25	10000	125	340.8
0	32650	26	9572	130	300.0
1	31030	27	9165	140	234.1
2	29500	28	8777	150	184.8
3	28054	29	8408		
4	26688				
5	25396	30	8056		
6	24173	35	6530		
7	23016	40	5325		
8	21921	45	4367		
9	20885	50	3601		
		55	2985		
10	19904	60	2487		
11	18974				
12	18092	65	2082		
13	17257	70	1751		
14	16465	75	1480		
15	15714	80	1256		
16	15001	85	1070		
17	14325	90	916.1		
18	13623	95	787.0		